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The Thenar and Hypothenar Types of Neural Atrophy of the Hand.

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THE THENAR AND HYPOTHENAR TYPES OF NEURAL ATROPHY OF THE HAND.

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The types of neural atrophy of the hand, to which I shall direct attention are unaccompanied by sensory disturbances, and for this reason are of especial clinical interest from their rather close resemblance to the early stage of the progressive muscular atrophy, of the Aran-Duchenne type. I believe that many of these cases are either interpreted as such or are regarded as very doubtful. The frequent association of the two affections (neural and medullary) with occupations requiring overuse of the hands and arms enhances the similarity.

It may be said, in general, that the localization of occupation neuritis in the upper extremity is by no means infrequent, and is recognized by all systematic writers on this subject. There are, however, associated sensory symptoms in the distribution of the affected nerve, which constitute an important part of the symptom complex. In literature these cases are usually designated by the name of the occupation which was instrumental in the production of the lesion: a rather crude manner of classifying such affections of the nerve trunks, as a variety of different occupations may produce the same lesion at the same level of the nerve trunk, providing the character of the movement required is the same.

In other words, it is not so much the nature of the occupation as the character of the movements and its frequent repetition, which plays the chief role in the etiology of the professional palsies. The exposed and superficial situation of some nerve trunks and their relation to bony prominences and tendons are also important factors.

The general constitutional condition, as well as intoxications of various kinds, also deserve consideration as predisposing factors. It is not uncommonly observed that a certain occupation may have been pursued for many years without ill effects, when a reduction of the general health, or alcoholic excess, is rapidly followed by the symptoms of neuritis.

The *motor types* of neural atrophy of the hand are characterized by an absence of objective sensory symptoms, and occur as two distinct clinical types—a *hypothenar type,* dependent upon a compression neuritis of the deep palmar branch of the ulnar nerve, and a *thenar type,* dependent upon a compression neuritis of the thenar branch of the median nerve. Both nerves are purely motor

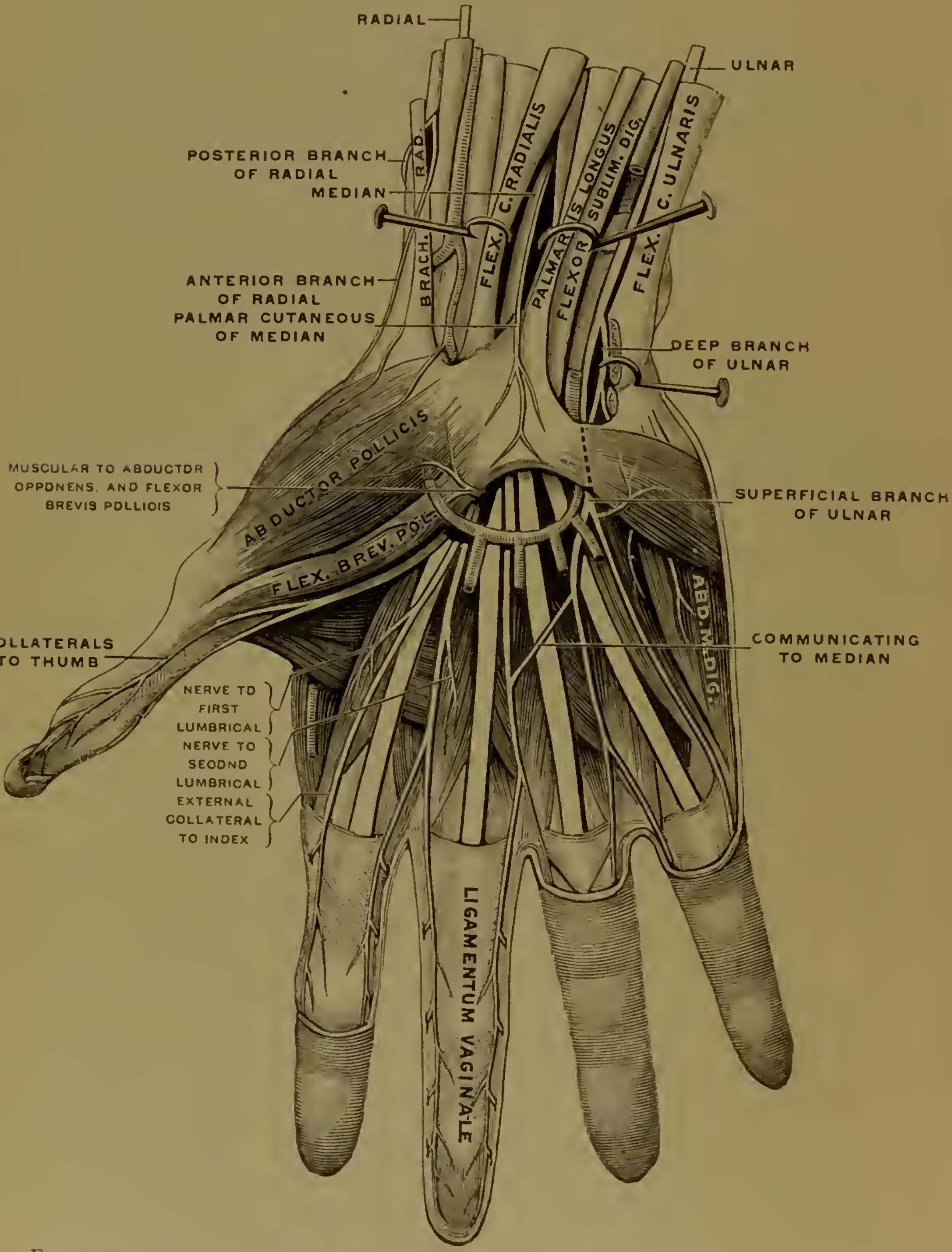

FIG. 1 (Testut's Anatomy).—Showing the superficial and deep palmar branches of the ulnar nerve, and the branches of the median nerve in the hand before removal of the anterior annular ligament.

in character, and together supply the entire musculature of the hand, with the exception of a small subcutaneous muscle, the palmaris brevis, which is innervated by a branch from the superficial palmar division of the ulnar nerve.

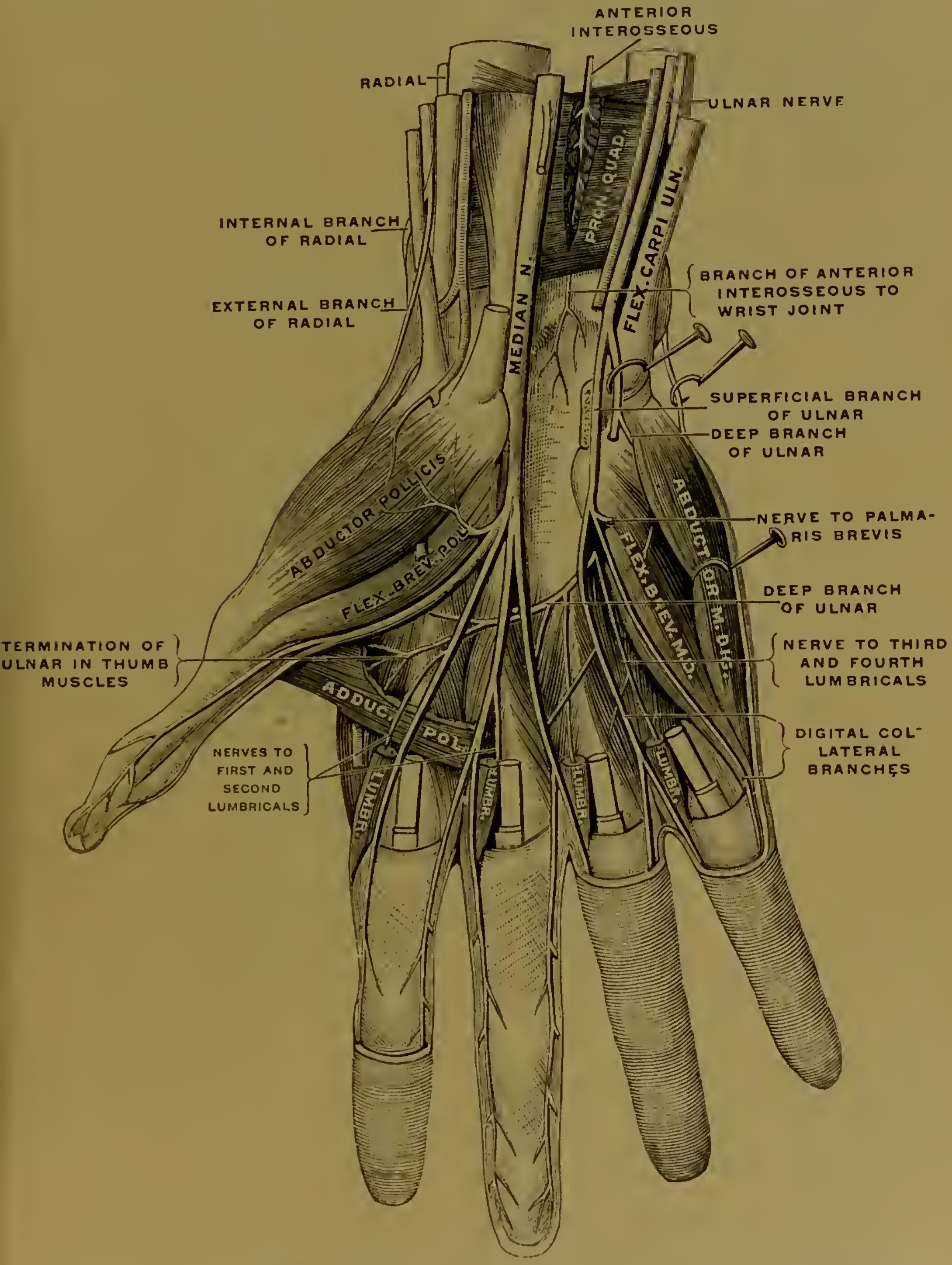
ANTERIOR INTEROSSEOUS
RADIAL
ULNAR NERVE
PRON. QUAD.
FLEX. CARPI ULN.
INTERNAL BRANCH OF RADIAL
EXTERNAL BRANCH OF RADIAL
MEDIAN N.
BRANCH OF ANTERIOR INTEROSSEOUS TO WRIST JOINT
SUPERFICIAL BRANCH OF ULNAR
DEEP BRANCH OF ULNAR
ABDUCTOR POLLICIS
NERVE TO PALMARIS BREVIS
FLEX. BREV. POL.
FLEX. BREV. M.D.
ABDUCT. OR M. DIG.
DEEP BRANCH OF ULNAR
TERMINATION OF ULNAR IN THUMB MUSCLES
NERVE TO THIRD AND FOURTH LUMBRICALS
ADDUC. POL.
DIGITAL COLLATERAL BRANCHES
NERVES TO FIRST AND SECOND LUMBRICALS
LUMBR.
LUMBR.
LUMBR.
LUMBR.

Fig. 2 (Testut's Anatomy).—Showing the branches of the ulnar and median nerves after removal of the annular ligament.

The paralysis of the *hypothenar type* is limited to the distribution of the ulnar nerve, and of the thenar type to that of the median nerve, and are accompanied by atrophy and the electrical reactions of degeneration in their respective distributions.

Anatomical Considerations. All the small muscles of the hand are supplied by either the median or the ulnar nerve. The median, through its *thenar* branch, innervates the abductor pollicis, the opponens pollicis, and the outer head of the flexor brevis pollicis. These muscles compose the outer portion of the thenar eminence; in addition, the first and second lumbricales are usually supplied by the median nerve (Figs. 1 and 3). The thenar branch is purely motor, and leaves the main trunk as it emerges from beneath the anterior annular ligaments of the wrist; it then turns back over the edge of this tendinous membrane, and passes toward the thenar eminence. The compression of the nerve, I believe, takes place as it passes over the annular ligament (Figs. 1 and 2).

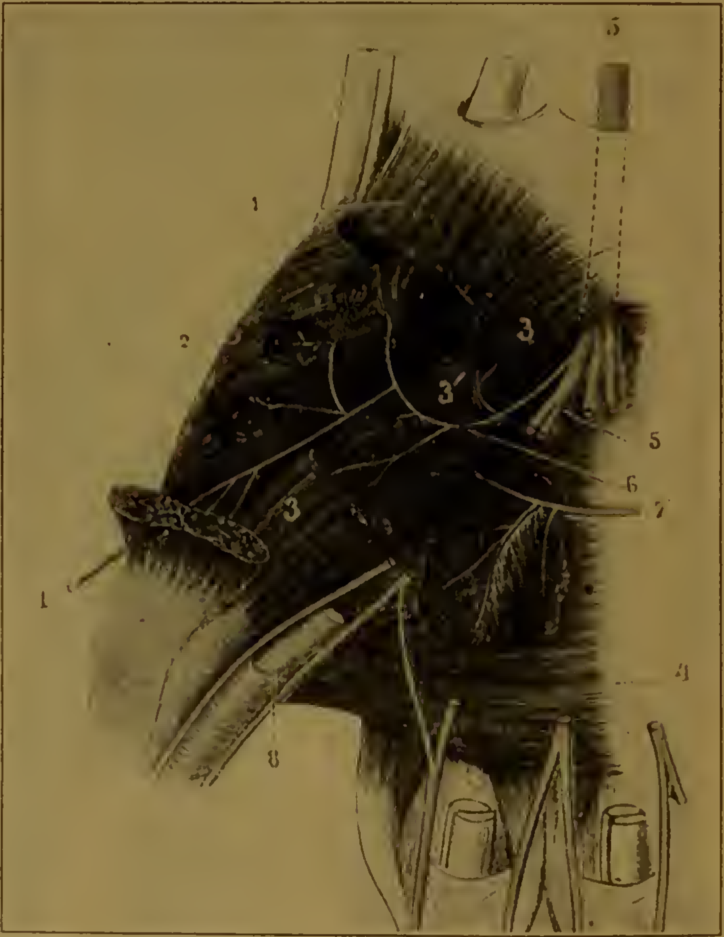

Fig. 3 (Testut's Anatomy).—Showing the motor branches of the thenar eminences: 1, abductor brevis pollicis; 2, the opponens pollicis; 3, 3′, superficial and deep heads of the flexor brevis pollicis; 4, adductor pollicis; 5, median nerve with, 5′, terminal branches; 6, nerve to the thenar muscles (thenar branch); 7, termination of the deep branch of the ulnar in the adductor pollicis and the deep head of flexor brevis pollicis.

All the remaining intrinsic muscles of the hand are supplied by the ulnar. This nerve, just above the level of the pisiform bone, divides into two terminal branches—the *superficial palmar*, which is sensory, and the *deep palmar*, which is purely motor. The deep palmar branch innervates all the muscles of the hypothenar eminence, the palmar and dorsal interossei, and the third and fourth lumbricales. Soon after its origin, the deep palmar passes between the tendinous origins of the abductor minimi digiti and the flexor brevis minimi digiti, in a downward, backward, and outward direction, winding in its course beneath the hook of the unciform bone, at which point it breaks up into its terminal muscular branches. Occasionally it pierces the tendon of the flexor brevis minimi digiti (Figs. 2 and 4).

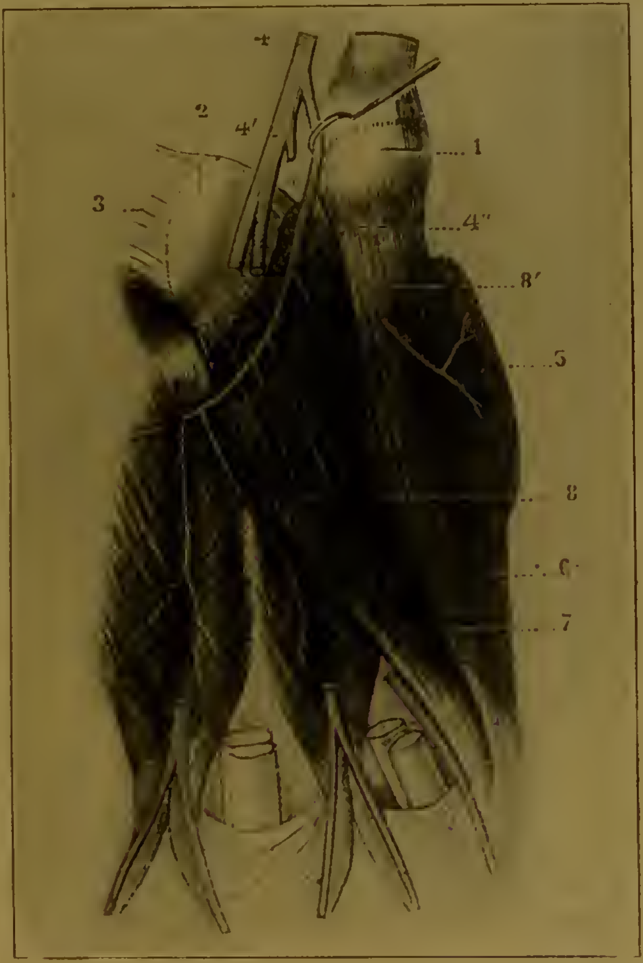

FIG. 4 (Testut's Anatomy).—Showing the deep palmar branch of the ulnar nerve and its relations to the tendinous origin of the abductor minimi digiti and the flexor brevis minimi digiti: 1, pisiform bone; 2, unciform process of the unciform; 3, anterior annular ligament; 4, ulnar nerve; 4′, superficial palmar branch; 4″, deep palmar branch; 5, palmaris brevis; 6, abductor minimi digiti; 7, flexor brevis minimi digiti; 8, 8′, opponens minimi digiti.

In the *hypothenar type* of neural atrophy the nerve is, I believe, compressed at this point; that is, after giving off of its superficial sensory branch and before breaking up into its muscular terminals.

As I have already indicated, the palmaris brevis is supplied by a small muscular branch arising from the superficial palmar, so that the function of this muscle would be preserved.

The intrinsic muscles of the hand are therefore supplied by two distinct nerve trunks, both of which are purely motor in character, the one arising from the median and the other from the ulnar nerve. Both of these branches, soon after leaving the trunk of the nerve, are in close relation with tendinous structures, so that when subjected to prolonged or unusual compression, as would occur in certain occupations, they would be exposed to the dangers of injury with consecutive degeneration of the nerve and atrophy of the corresponding muscles.

A Case of Occupation Neuritis of the Deep Palmar Branch of the Ulnar Nerve (Hypothenar Type of Neural Atrophy of the Hand).

J. R., single, aged forty-seven years, has been an oyster opener by occupation for many years, having opened on an average from four to five thousand oysters a day. He has always indulged freely in alcohol, and more especially during the past year. He has had gonorrhœa several times, and a chancroid at the age of seventeen. He denies lues. In opening the oysters he uses the usual oyster knife, having a heavy metal handle and a short blade. The knife handle rests in the hollow of the hand, and is grasped firmly by the fingers, more especially by the little and the ring fingers; the thumb being pressed against the opposite side of the handle, in this way making the grasp firm and guiding the direction of the blade. So that in using this knife, the act consists chiefly in flexion of the fingers, more especially of the little and ring fingers, with an opposing movement of the thumb; the handle is not pressed against the hypothenar region with any degree of power.

ONSET. Three months before coming under my observation he noticed while working that he experienced considerable difficulty and awkwardness in handling the knife. The following day his hand was no better, and he was forced to abandon his occupation. Since that time he has been unable to resume work. He experienced no pain in the hand whatever, and at no time were there any paresthetic disturbances in the fingers.

PRESENT CONDITION. The patient is a short, somewhat corpulent, and very muscular man. The general physical and neurological examination is negative. On extending, or attempting to extend, the fingers of the right hand, there develops a slight tremor, which is not present on the left. The fingers cannot be completely extended, but are held in a somewhat flexed position, which is more apparent in the little and the ring fingers. Both the little and the index fingers are held somewhat abducted, while the middle and ring fingers remain in close apposition. There are evident signs of muscular atrophy in the intrinsic muscles of the hand, and the hypothenar eminence feels soft and flabby. No fibrillary twitchings are visible. He is unable to separate or approximate the fingers. Adduction of the thumb is possible, but with much less force than on the left side. He is also unable completely to extend the middle and distal phalanges, or to flex the basal phalanges while holding the fingers extended. No voluntary movements are possible in any of the muscles of the hypothenar eminence, *with the exception of the palmaris brevis muscle,* which produces the typical creasing of the skin over the hypothenar region. The movements of the thumb are, on the contrary, quite free and active, and there is very good power of abduction and apposition. Flexion of the basal phalanx of the thumb and adduction are distinctly paretic.

There is normal power in the extensors and flexors of the wrist, and in the long flexors and extensors of the fingers. I would especially emphasize the preservation of the ulnar flexion of the wrist and the long flexors of the fingers supplied by the ulnar nerve. The muscles of the upper arm and shoulder are normal.

The tendon reflexes of both upper and lower extremities are normal. There is no tenderness of the nerve trunks or of the muscular tissues of the right arm and hand. The skin of the right arm, hand, and fingers shows absolutely no impairment of sensation to touch, pain, or temperature. The deep sensibility of the fingers is preserved, and the stereognostic sense is unimpaired.

Electrical Reactions. The muscles of the upper arm and forearm react normally to both currents. Strong faradic and galvanic currents passed through the ulnar nerve in the groove at the elbow produce flexion movements of the wrist and fingers on the ulnar side, but no response in the intrinsic muscles of the hand. Currents passed through the median nerve at the bend of the elbow and in the forearm produce distinct contraction in the muscles of the thenar eminence. Strong faradic currents applied directly to the muscle fail to elicit any response in the muscles of the hypothenar eminence or the interossei. A good response, however, is obtained in the muscles of the thenar eminence. The direct galvanic current produces in the muscles of the hypothenar and interossei a slow vermicular response with definite polar changes. In the thenar eminence a normal galvanic response is elicited over the area of the abductor and opponens pollicis. If stronger currents are used, and if the electrode is placed over the eminence toward the ulnar side of the hand, a mixed normal and degenerative reaction ensues, evidently from diffusion of the currents to the deeper muscles of the thenar region which are degenerated.

REMARKS. The case just described presents a paralysis of all the intrinsic muscles of the hand supplied by the ulnar nerve, with evidences of atrophy. The reactions of degeneration are complete. Sensation over the ulnar distribution is normal, and at no time was pain or paresthesias experienced in this area. Furthermore, the small muscle group of the thenar eminence supplied by the median nerve was normal in its function and electrical responses. The man had been an oyster opener since his boyhood, and had never previously experienced any difficulty of this nature. He was, in addition, addicted to alcohol, which had been excessive during the last year, so that aside from occupation as a factor, a toxic element must also be considered (toxico-professional palsy). In using the oyster knife the heavy handle did not impinge on the base of the hypothenar region, so that direct pressure upon the nerve trunk may be excluded. It was held chiefly in the grasp of the fingers, more especially of the little and ring fingers, assisted by the opposing movements of the thumb. Flexion of the basal phalanx of the little finger brings into action both the abductor and flexor brevis minimi digiti, which would cause a compression of the nerve as it passes between the tendinous origin of these two muscles. I would particularly emphasize the preservation of the palmaris brevis muscle, which receives its innervation through the superficial palmar, which is additional clinical proof in favor of placing the site of the compression in the deep volar branch.

In my original paper on this subject,[1] three cases were recorded associated with the following occupations: That of jeweller, brass polisher, and machinist. A summary of the clinical pictures is briefly as follows (Fig. 5): The palsy developed without the accompaniment of pains, paresthesias, or anesthesias in the ulnar nerve distribution. On holding out the affected hand the fingers could not be completely extended, a slight flexion persisting in all, but more especially in the little and ring fingers. The index and little fingers are held somewhat abducted, while the middle and ring fingers remain in close apposition; there is a loss of spreading and approximation movements of the fingers, of flexion of the basal phalanges, and of extension of the middle and distal phalanges. Adduction of the thumb is also lost or very much diminished. Flexion of the basal phalanx of the thumb is weakened; abduction and apposition of the little finger are abolished. In brief, an ulnar paralysis, limited to its distribution in the hand. With the paralysis there is more or less atrophy of the muscles, and electrical reactions of degeneration are present. In all of the cases there was a considerable impairment of the more delicate functions of the hand, and the occupation instrumental in producing the palsy had to be abandoned.

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[1] Occupation Neuritis of the Deep Palmar Branch of the Ulnar Nerve, Jour. of Nerv. and Ment. Dis., 1909.

With the preservation of the long flexors and extensors of the wrist and fingers, and the muscles of the thenar eminence supplied by the median nerve, there still remained a considerable degree of power and variety of movement in the hand. This paralysis without sensory disturbances I attributed to a compression neuritis of the deep volar branch of the ulnar, as it passes between the tendinous origin of the muscles of the hypothenar region (Figs. 2 and 4).

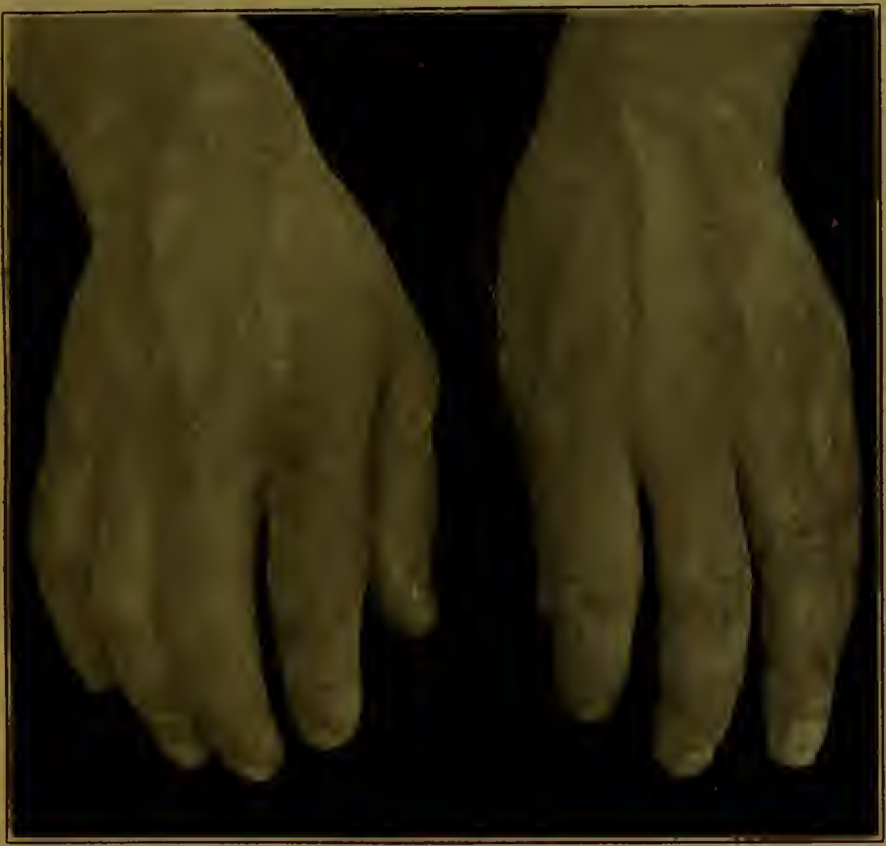

Fig. 5.—Occupation neuritis of the deep palmar branch of the ulnar nerve, occurring in a jeweller, with atrophic paralysis of the intrinsic muscles of the left hand supplied by the ulnar nerve. Complete reactions of degeneration. No objective sensory disturbances.

In all of the cases in which this form of paralysis occurred the occupation was one requiring flexion movement of the fingers, more especially of the basal phalanges. When the basal phalanx of the little finger is flexed. both the abductor and the short flexor are put in action, and as the short abductor takes its origin from the pisiform bone, and the short flexor from the hook of the unciform, the deep volar branch separating them at their points of origin, persistent and long-continued flexion of these muscles would seriously expose this nerve to the dangers of muscular compression. The possibility of traction must also be considered from the relation it bears to the hook of the unciform.

Cases of Compression Neuritis of the Thenar Branch of the Median Nerve (Thenar Type of Neural Atrophy of the Hand).

CASE I.[2] (Neurological Clinic of the Cornell Medical School).—E. G., aged fifty years; engaged in the occupation of folding and sealing newspapers, for mailing purposes, during the last thirty years. He works in all about seven hours a day. During this time he folds and sorts heavy sheets of paper, which bring into play chiefly the thumb and fingers. After the packages are sealed they are carried and deposited in a convenient place, which throws a considerable strain on the arms and shoulders. Occasionally during the last nine years, after an unusual stress of work, he has experienced a general numb, tired feeling in the arms and shoulders, and at times the fingers felt numb and would tingle, but this would soon pass off with rest and never lasted more than an hour or so. At times he also has a cramp-like sensation in the right hand, especially the thumb. This also was very transient in nature. In folding the heavy sheets of paper the strain is largely caused by the pressure of the thumb against the roll, more particularly of the right hand. About two years ago, he first noticed a slight wasting of the muscle along the radial side of the thenar eminence. This area was small at first, but gradually increased in size, up to a certain point, and has remained stationary ever since. During this time he continued his occupation, saving the right hand as much as possible, which threw an unusual amount of strain on the left. Of late, he finds that the left hand is also becoming affected in a similar manner.

PRESENT CONDITION. The general neurological examination is negative. The heart, lungs, and kidneys present no symptom of disease. Both upper extremities are well developed and present no diminution in the gross motor power, with the exception of the movements of the thumb on the right side, and to a less extent on the left. There are no fibrillary twitchings, and the biceps, triceps, and supinator reflexes are present.

There is in the right thenar region a sharply defined atrophy, which extends along the outer side of the eminence. This presents a rather deep depression, as if the muscular tissue had been scooped out (Fig. 6).

Over the left thenar eminence a slight flattening is perceptible along the metacarpal bone, and the muscular tissue is soft and doughy. There is, however, no well-marked atrophy. The other intrinsic muscles of the hand, the hypothenar and the interossei, present no signs of atrophy and no diminution in their motor power. The sensation of both upper extremities is unimpaired,

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[1] Presented at a meeting of the New York Neurological Society, November, 1909.

and very careful tests of the tactile, pain, and thermic sensibility of the hands show no objective impairment in either the ulnar or median distribution. The dynamometer on the right hand registers 38, and on the left, 41.

Electrical Reactions. Electrical examination of the upper extremities shows normal reaction in all the muscles, with the exception of those composing the thenar eminence in the distribution of the median nerve. An indirect faradic or galvanic current passed through the median nerve at the bend of the elbow, fails to produce any response in the corresponding muscles of the thenar region on either the right or the left side. Faradic currents directly applied to the right thenar fail to produce a reaction in either the abductor or opponens pollicis. Strong galvanic currents applied directly to the right thenar region over the atrophic area produce a slight vermicular response in a small muscle remnant. Direct faradic excitation of the left thenar eminence fails to elicit any response in the abductor pollicis or opponens pollicis. The galvanic current produces a typical slow vermicular reaction in these muscles, with reversal of the poles.

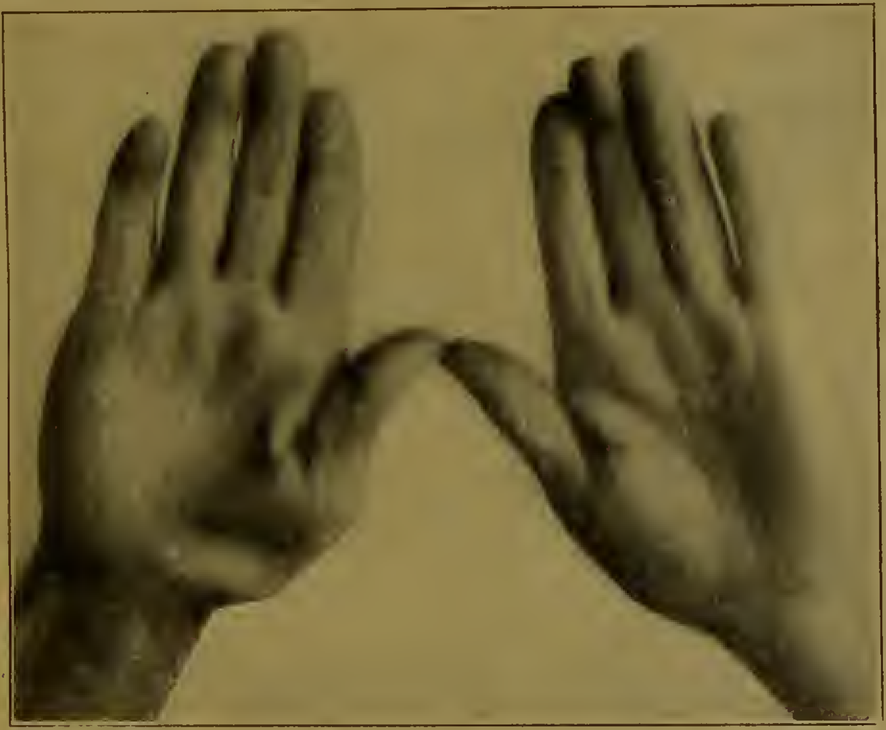

FIG. 6.—Occupation neuritis of the thenar branch of the median nerve, showing a circumscribed atrophy of the right thenar eminence which contains a remnant of muscular tissue showing the reactions of degeneration; the sensations are normal. A scarcely perceptible flattening of the left thenar, with complete reactions of degeneration in the abductor and opponens pollicis is present.

The patient was advised to give up his occupation, and electrical treatment has been systematically carried out. On November 22, 1908, the atrophy of the right thenar eminence was the same as on the first examination. There was also present a slight but definite flattening over the left thenar region, as was previously noted. The electrical changes were practically the same as on the first examination; that is, no response in the right thenar over the atrophic area excepting to strong galvanic currents, which elicited a vermicular response in a persisting muscle remnant, of which the anodal closing contraction was greater than the cathodal closing contraction. In the left thenar region the abductor pollicis and opponens pollicis showed complete reactions of degeneration. There was an absence of pains, paresthesias, or objective sensory disturbances in the hands or fingers; no fibrillary twitchings and no evidence of atrophy in the small muscles of the hand supplied by the ulnar nerve.

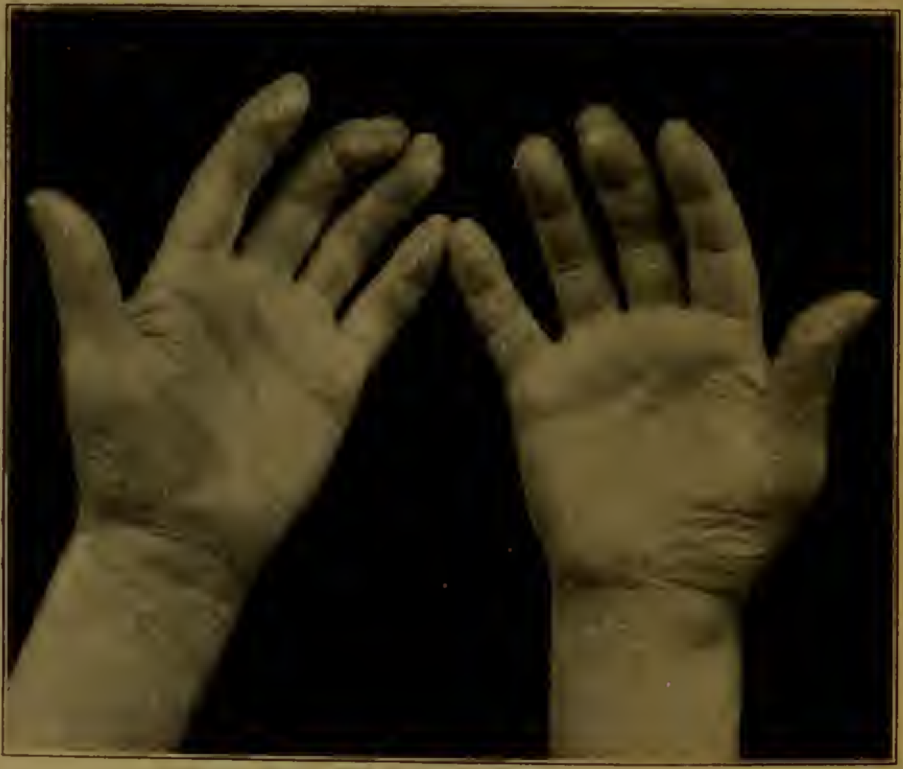

Fig. 7.—Photograph of same case as Fig. 6, taken one year later. The atrophy of the right thenar is less marked, and there is still slight flattening apparent over the left thenar, with reactions of degeneration. No sensory disturbances.

June 1, 1909. Patient complains occasionally of dull aching pain in the right metacarpal joint, both at its articulation at the wrist and with the thumb. These seem to change with the weather. He has no paresthesias and no objective sensory disturbances in the median or ulnar distribution. At times he has an aching pain in the left thenar region, which is dull in character. The flattening along the left thenar eminence is less marked, and the atrophic excavation of the right thenar is less sharply defined (Fig. 7). Electrically there is no faradic response in the abductor or opponens pollicis on either side. The left thenar still shows sluggish galvanic responses with reversal of the poles, and in the right no reaction at all is elicitable, save for the small muscle remnant previously noted.

Case II. (Referred by Dr. Isadore Abrahamson, of New York).—Patient is a woman, aged sixty-nine years, married, and has two children; a housewife by occupation. When about fifty years of age she did considerable ironing, working many hours each day. In using the irons she held the thumb well under the handle, so that there was no direct pressure upon the thenar eminence. She, however, grasped the handle firmly, which would bring into play the small muscles of the thumb. A little later she first noticed a slight wasting of the right thenar region along its radial side, which gradually increased in size. A year later a similar condition developed in the thenar region of the left hand, likewise along its radial border. These areas of atrophy have persisted up to the present time and have remained stationary. She never gave up ironing, but did less as she grew older. At the time of the onset she had a numb feeling in the extreme tips of all the fingers of both hands. This, however, was not permanent, and would come and go. It was not confined to the median distribution, and was more in the nature of an acroparesthesia.

Present Condition. April 28, 1909. The patient has a typical *thenar atrophy* on both sides, more marked upon the right than on the left. There are no fibrillary twitchings, and no atrophy or weakness in the other muscle groups of the hands or arms. The arm-jerks are present, and the *objective sensation is perfectly normal.* There is not the slightest trace of any disturbance of the touch, pain, or temperature sensibility in either the ulnar or the median distribution of the hand.

Electrical Examination. There is no faradic response, either direct or indirect, in the abductor pollicis or opponens pollicis on the right or left side, nor can these muscles be contracted through the median nerve by strong galvanic currents. The direct galvanic current applied to the right thenar eminence, where the atrophy is more marked, elicits no response whatever. In the left hand, however, a slow vermicular reaction is produced in the atrophic area, the anodal closure contraction being greater than the cathodal closure contraction.

Case III. (Verbal communication by Dr. H. M. Moyer).—Following the discussion of my paper,[3] which was read at a meeting of the American Neurological Association in May, 1909, one of the members communicated to me, a personal experience with thenar atrophy. This had come on after a long bicycle ride, during which he had used hard grips on the handle bars. A few days later he noticed fibrillation and waving of the muscular tissue along the radial side of the right thenar eminence. This was followed in the course of a week or two by distinct wasting of the muscles, which corresponded exactly to the distribution of the thenar branch of the median nerve, as shown in Fig. 6. With the appearance of atrophy, the fibrillary waves ceased and did not recur subsequently.

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[3] Occupation Neuritis of the Thenar Branch of the Median Nerve: A well-defined Type of Clinical Atrophy of the Hand. Trans. Amer. Neurological Association, 1909.

At no time were pain, subjective or objective disturbances of sensation in the hand noted. Some of his colleagues suggested the pleasing possibility of progressive muscular atrophy, but in the course of a few months the scooped out, atrophic depression of the thenar region began to fill in, and at present no difference in the volume of the two sides is apparent.

REMARKS. The thenar type of neural atrophy of the hand is readily recognized by the characteristic limitation of the atrophy to the abductor pollicis, the opponens pollicis, and the outer head of the flexor brevis pollicis, all of which are supplied by the thenar branch of the median nerve. As the atrophic area is situated between the first metacarpal bone externally and the body of the inner portion of the flexor brevis pollicis, a sharply demarcated depression results, as if the muscular tissue had been scooped out.

The electrical reactions vary with the stage and the degree of the atrophic process, and are characteristically neural. Objective disturbances of sensation in the distribution of the median nerve were absent in all of the cases, so that the thenar filaments must have been injured after leaving the main trunk of the median (Figs. 1 and 2).

It will be recalled, from the anatomical descriptions, that immediately after leaving the main trunk the thenar branch stands in immediate relationship to the palmar border of the anterior annular ligament, beneath which it emerges and over which it passes in a backward and outward direction to its destination in the muscles of the thenar region. The injury to the nerve, therefore, must take place at this point, induced by the continuous or frequently recurring pressure of muscular action.

The general usefulness of the hand is not greatly impaired in this type of neural atrophy, except for finer movements, in which the thumb plays an important role, as, for instance, in writing.

The first metacarpophalangeal joint may also be considerably weakened and relaxed as a result of the atrophy.

Because of the comparatively slight disturbance of the general power and utility of the hand, the occupation which was instrumental in the production of the paralysis is sometimes persisted in, and under these circumstances the atrophy may become permanent, as in Case II and probably in Case I, although here a slight improvement was apparent after electrical treatment for one year. In Case III the complete restoration of muscular tissue and function is to be attributed to the prompt recognition of the etiological factor and its removal.

The prognosis in these cases may therefore be regarded as favorable, if the causative factor is discovered at an early stage and proper precautionary measures and treatment are instituted. In the literature of professional palsies and atrophy of the hand, cases are cited in which there was an atrophy of the thenar eminence, usually, however, in conjunction with other of the small muscles of the hand, or with sensory disturbances in the median distribution.

I am aware of no reported cases in which the atrophy has been shown to be limited to the thenar distribution of the median nerve, as in the group of cases just described, the clinical importance of which is dependent upon their resemblance to the hand atrophy of spinal origin.

DIAGNOSIS. The *neural types* of atrophy of the hand muscles are readily separated from those of myelopathic and myopathic origin by the strict limitation of the paralysis to the distributions of the ulnar and the median nerves and by the degenerative character of the electrical reactions.

The absence of sensory disturbances serves to separate them from the atrophy which follows lesions and compressions of the ulnar and median nerves higher up, that is, above the origin of the deep palmar and thenar (motor) branches.

In the *thenar* and *hypothenar types* of neural atrophy the distribution of the palsy and accompanying atrophy are the same as after other lesions of the median and ulnar nerves, the degree of the atrophy depending upon the severity and duration of the palsy.

In none of the cases were fibrillary twitchings present in the affected muscles, with the exception of one case only, in which fibrillary waves were noted at the time of onset, but ceased with the appearance of atrophy, and did not recur subsequently. In reaching a diagnosis, I would emphasize the importance of demonstrating the limitation of the paralysis, atrophy, and degenerative reactions to the motor distribution of the ulnar or median nerves, as the case may be. This neural limitation of the palsy may be overlooked unless special care is exercised, as there are no sensory symptoms to suggest the nerve distribution. In the hypothenar type there is some atrophy of the muscles which go to form the thenar eminence, that is, the adductor pollicis and the inner head of the flexor brevis pollicis, which are supplied by the ulnar nerve. This produces some flattening and atrophy in the thenar region, and might simulate involvement of the median nerve on superficial examination. Still greater care must be exercised in interpreting the electrical reactions in the thenar type of atrophy. The diffusion of currents to a part of the flexor brevis pollicis and the adductor pollicis, both of which are supplied by the ulnar nerve, may give the impression of a positive reaction of degeneration in the thenar region, and yet the muscles supplied by the thenar branch of the median nerve may be perfectly normal.

I would also recall a type of occupation atrophy of the hand described by Gessler,[4] which bears some resemblance to the hypothenar type of neural atrophy. This question I have already discussed at some length in a previous communication.[5] Gessler[6] regarded the underlying lesion in his cases as a degeneration of the motor end-plates and intermuscular nerve terminals, induced by prolonged and persistent muscular contractions with insufficient muscular relaxation, this producing an anemia of the parts, with consecutive degenerations of these delicate neural structures. As a basis for this theory he presented the results of some experimental studies in warm- and cold-blooded animals in which such lesions were produced. In my opinion, Gessler's views require further clinical confirmation before they are accepted as the pathological basis for a group of professional muscular atrophies. The class of cases which I describe are, however, readily separated by the strict limitation of the atrophic palsy to the distribution of either the median or ulnar nerves.

A Case of Progressive Muscular Atrophy, Resembling the Thenar Type of Neural Atrophy (Fig. 8).

The following case is recorded as showing the rather close resemblance which may exist between the spinal and the neural atrophy of the hand.

The patient, a woman, unmarried, aged forty-two years, was admitted to the Cornell Clinic, March 22, 1910. Since her eighteenth year she has been a victim of epilepsy. She is a waitress and helper in a hotel; there is nothing exceptional in her occupation, which is more or less general in character, except that three times each day she slices bread for the entire establishment, which requires constant cutting for about twenty minutes. For this purpose a large bread knife is employed, which is grasped firmly by the right hand. There is no history of venereal disease or of alcoholic excesses. One year ago she passed through an attack of subacute articular rheumatism, lasting about seven weeks.

Her present trouble dates from June, 1909, when she first noticed a slight weakness of the right hand, and about the same time a flattening and wasting of the ball of the right thumb, both of which have gradually grown worse. There has been no pain in the hand at any time and no paresthesia.

Examination. There is a well-marked atrophy of the right thenar eminence along its radial side (Fig. 8). There is also a slight, scarcely perceptible thinning of the muscles of the third and fourth interosseous spaces and of the hypothenar region. Fibrillary twitchings were not demonstrable at first, but subsequent examinations revealed their presence in the interossei and in some of the muscles of the hypothenar. The ulnar side of the forearm is also the seat of slight wasting, there being a difference of one-half inch between the two sides. All movements of the right hand are readily performed, but are distinctly weaker than the left. The gross motor power of the other muscles of the upper extremity is undiminished.

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[4] Die motorische Endplatte und ihre Bedeutung für die peripherische Lähmung, Habilitations Schrift, München, 1885.

[5] Jour. Nervous and Mental Disease, 1909.

[6] Eine Eigenartige Form von progressiver Muskelatrophy. Med. Correspondenzbl, 1890, 281.

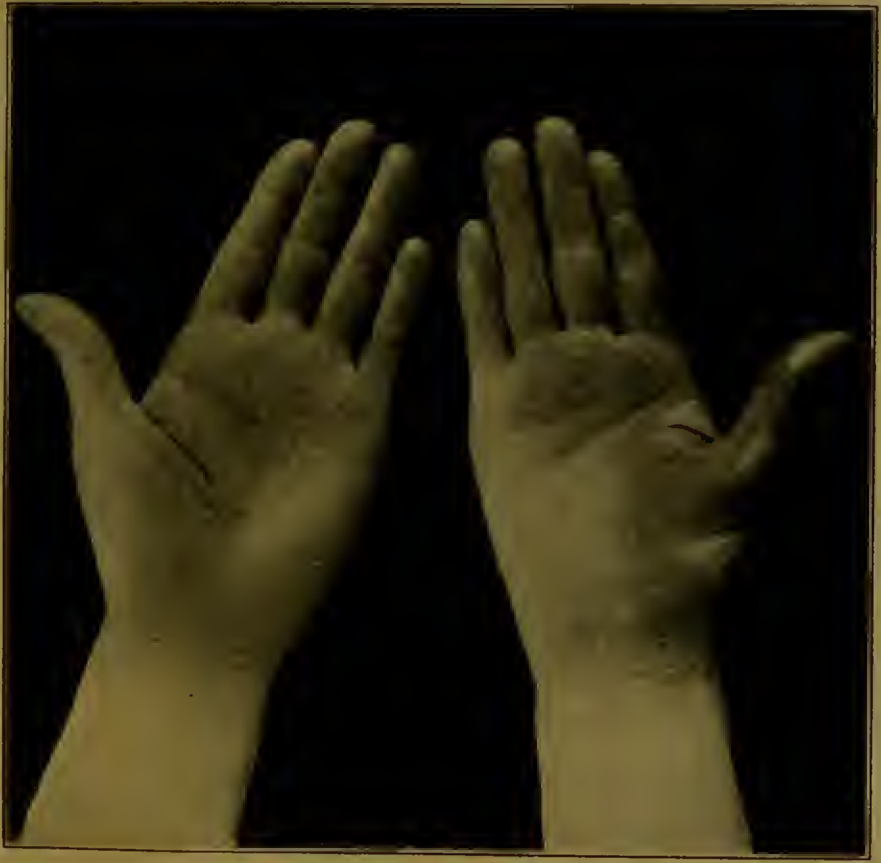

FIG. 8.—A case of early muscular atrophy of spinal origin, resembling the thenar type of neural atrophy. In addition to the wasting on the radial side of the thenar, there were atrophy and fibrillations of the interossei and slight atrophy along the ulnar side of the forearm.

The reflexes of the upper extremity are active on both sides, but more so on the right, where the periosteal and bone reflexes of the hand and fingers are readily elicited. Sensation is perfectly normal. The tendon reflexes of the lower extremities are present and active, but not exaggerated. There is no Babinski phenomenon on either side.

The pupils are equal and react normally. A careful general and neurological examination failed to reveal any symptoms, other than the weakness with atrophy of the right hand, with fibrillary twitchings and exaggeration of the reflexes of the right upper extremity.

Electrical Reactions. Strong faradic and galvanic currents passed through the median nerve fail to elicit any response in the atrophic muscles of the right thenar eminence. A strong faradic current applied directly to the thenar eminence produces a sluggish response, which apparently originated in the opponens pollicis. The direct galvanic current elicits a slow vermicular response in the thenar region, in which the A C C is > K C C. The electrical response, both direct and indirect, of the other intrinsic muscles of the hand, as well as those of the forearm, are practically normal.

COMMENT. This case is interesting from a diagnostic point of view.

The atrophy is well defined in the thenar region, and at the first glance appears limited to the distribution of the thenar branch of the median nerve (Fig. 8). The completeness of the reactions of degeneration, which are confined to the muscles of the thenar region, are also very suggestive of a neural origin.

A more careful scrutiny of the case, however, shows a slight general wasting of the hypothenar, interossei, and along the ulnar side of the forearm, with fibrillations, exaggerated arm reflexes, both tendon and periosteal; so that the muscular atrophy must be interpreted as of spinal origin, an early stage of the Aran-Duchenne type.

It is, of course, not impossible that the two conditions, neural and spinal, may be present in combination, as certain occupations requiring excessive use of the hands are recognized etiological factors in both groups of cases. It is certainly singular that atrophy and reactions of degeneration should be so circumscribed to the distribution of the thenar branch in a case of progressive muscular atrophy.

CONCLUDING REMARKS. In addition to the atrophic paralyses of the intrinsic muscles of the hand, of *myelopathic* and of *myopathic* origin, I believe that a *neural* type should also be recognized. Those of neural origin may be separated into two well-defined clinical types, both due to a compression lesion of a *motor* branch of a mixed nerve. These may be appropriately designated as follows:

A *hypothenar type*, which term indicates the site of the compression at the base of the hypothenar eminence and its relationship to the ulnar nerve.

A *thenar type*, which also indicates the site of the compression at the base of the thenar eminence, and the relationship to the median nerve.